

Site Need Statement

General Reference Information	
1 *	Need Title: Improved Double Shell Tank (DST) Integrity Nondestructive Examination (NDE) Measurement Tools
2 *	Need Code: RL-WT067
3 *	Need Summary: Compliance to Washington Administrative Code (WAC) 173-303-640 and Washington Department of Ecology (Ecology) Administrative Orders Numbers 00NWPKW-1250 and -1251 requires life cycle integrity assessments, including Non-destructive Evaluation (NDE) of all 28 DSTs. Current practice is to ultrasonically examine a 30-inch-wide vertical strip of the primary tank cylinder and heat-affected zones of selected horizontal and vertical welds, in each DST. This comprises approximately 1% of the primary tank wall, which raises issues as to the adequacy of the sample size.
4 *	Origination Date: FY 2000 (3/24/99)
5 *	Need Type: Technology Need
6	Operation Office: Office of River Protection (ORP)
7	Geographic Site Name: Hanford Site
8 *	Project: Safe Storage/Tank Farm Operations PBS No.: RL-TW03
9 *	National Priority: <u>X</u> 1. <u>High</u> - Critical to the success of the EM program, and a solution is required to achieve the current planned cost and schedule. ___ 2. <u>Medium</u> - Provides substantial benefit to EM program projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays). ___ 3. <u>Low</u> - Provides opportunities for significant, but lower cost savings or risk reduction, may reduce the uncertainty in EM program project success.
10	Operations Office Priority: High
Problem Description Information	
11	Operations Office Program Description: The overall purpose of the safe-storage function is to operate and maintain the double shell tank (DST) and single shell tank (SST) farms in a safe and compliant manner until the contained wastes are retrieved and the tank farms are ready for closure. This includes performing day-to-day operations, maintaining and upgrading infrastructure, resolving safety issues, assessing tank integrity, characterizing the waste, and managing the DST waste inventory. This function also includes interim stabilization of selected SSTs. The end state of safe storage is containment of DST and SST tank wastes in a manner that supports safe waste retrieval for final waste disposal; tank-farm structures, including DSTs and SSTs, ready for final disposal and closure; and tank farms amenable and ready for the mitigation of any environmental releases that occurred during storage and retrieval of tank waste.
12	Need/Problem Description: Comprehensive NDE of DST primary and secondary tank walls is required to improve estimates of remaining useful DST life, and to provide reliable input to decisions on DST replacement. NDE equipment used to date requires a 24-inch riser for deployment, allowing access to only 10 to 12% of the circumference of each DST, through each of two such risers. Access is limited because a camera, with limited lighting and power/transmission cable length, guides remote operation of the NDE equipment. There are also obstructions, such as air supply lines, preventing access to the rest of the wall. For convenience, the required 30-inch-wide vertical scan of the tank wall is aligned with the 24-inch riser providing access. A system that allowed relatively rapid screening of the entire vertical portion of the primary tank wall between air pipes (which deliver ventilation air for cooling to the tank bottom), would identify areas of primary concern within 10 to 12% of the primary tank surface accessible through a single 24-inch-diameter riser, and would provide a basis for selecting a preferred location for the 30-inch-wide more sensitive ultrasonic scan. Consequences of Not Filling Need: Issues regarding the representativeness of the roughly 1% of the tank

	<p>surface ultrasonically examined using existing technology, and whether 1% is an adequate sample size, could be raised, potentially jeopardizing the acceptability and basis for the DST system integrity assessment report to be submitted March 2006 under the existing administrative orders.</p> <p>** Program Baseline Summary (PBS) No.: RL-TW03</p> <p>** Work Breakdown Structure (WBS) No.: 5.01.03.05</p> <p>** TIP No.: T03-05-300, "Assess Need for DST Replacement," April 2005</p>
13	<p>Functional Performance Requirements: Functional requirements for NDE include characterizing and locating flaws in heat-affected zones of welds, locating and sizing surface pits, and measuring wall thickness on 3/8-inch to 15/16-inch-thick plates on 75-ft-diameter walls. For wall thinning, the detection capability of existing NDE equipment is ± 0.02 inches. For pitting, the detection capability of current NDE equipment is ± 0.05 inches. The location of reportable indications shall be repeatable to within ± 1.0 inch. The required sensitivity of NDE equipment used for screening would be less stringent.</p> <p>The NDE system must be capable of performing reliably in rough surface conditions including, but not limited to, weld spatter, mill scale, rough weld surfaces, and corrosion compounds. The NDE screening equipment will be expected to perform in a high radiation area. The NDE screening equipment will also be expected to perform in high humidity environments and surface temperatures up to 180°F.</p> <p>Privatization Potential: A vendor with experience in application of NDE technologies for commercial use would do the development of the NDE screening equipment.</p>
**	<p>Schedule Requirements: Technology Insertion Point (TIP) milestone T03-05-300 for the River Protection Protect schedules a decision on DST replacement by April 2005. Ultrasonic examination of DSTs completed prior to that decision point will be used to establish a baseline indicating how well tanks have survived to date, and to improve estimates of remaining useful life. Availability of improved NDE screening tools in the period FY 2002 through FY 2005 would support validation of the representativeness of ultrasonic examination data used in estimating corrosion rates and remaining useful life of DSTs, and in integrity assessment of the DST system to meet Administrative Orders NWPKW-1250 and -1251 requirements.</p>
14	<p>Definition of Solution: Develop a NDE screening tool to identify potentially problematic areas and select locations for NDE using existing equipment.</p>
15 *	<p>Targeted Focus Area: Tanks Focus Area (TFA)</p>
16	<p>Potential Benefits: Less potential large negative impact on mission from potential early tank failure</p>
17 *	<p>Potential Cost Savings: \$50,000,000</p>
18 *	<p>Potential Cost Savings Narrative: Improved methods for ultrasonic examination of DSTs leads to better understanding of how tanks have survived to date, better estimates of remaining useful life, and better decisions on building or not building new tanks. The estimated cost to build a new 6-tank farm (Multi-Function Waste Tank Facility) was \$435 million in 1993 dollars. The adverse cost impact for building even one additional DST, if it is not needed, is therefore in the tens of millions of dollars. If DSTs failed (e.g., leakage through the primary shell into the annulus) prior to the end of their storage mission, costs associated with recovery actions, including schedule delays in the overall RPP mission, would also be large.</p>
**	<p>Technical Basis: The Washington Administrative Code (WAC), Section 173, requires periodic integrity assessments. Ecology and DOE's Office of River Protection (ORP) have agreed to perform limited NDE by ultrasonic testing, on all 28 DSTs, as part of the required integrity assessments. The current NDE equipment uses a 24-inch riser for deployment, allowing access to 10 to 12% of the tank circumference, from each of the two 24-inch risers on each DST. Existing ultrasonic examination technologies cover approximately 1% of the DST primary tank vertical wall.</p> <p>A system that allows relatively rapid screening of the entire accessible area, through a 24-inch riser, will identify areas for subsequent examination using more sensitive NDE equipment. This would lead to improved assessment of existing tank conditions, and increased confidence in decisions on building or not building new waste storage tanks.</p>

19	Cultural/Stakeholder Basis: Given the history of single-shell tank failures and resulting contamination of soil and groundwater, uncertainty regarding existing DST conditions and rate of deterioration of DSTs by corrosion could raise stakeholder concerns.
20	Environment, Safety, and Health Basis: Assessing the integrity of the DSTs reduces the risk of leaks, by allowing early detection of any degradation of DSTs and timely corrective action, including tank replacement.
21	Regulatory Drivers: Washington Administrative Code 173-303-640(2)(c)(iii) requires a physical examination (NDE) or leak test as a part of an integrity assessment program. Washington Department of Ecology Administrative Orders 00NWPKW-1250 and -1251 provides additional examination requirements.
22 *	Milestones: TIP Milestone T03-05-300, "Assess Need for DST Replacement", April 2005, and submit DST system integrity assessment report, March 2006, TPA Milestone M-48-14 (draft).
23 *	Material Streams: ID-2113 Sludge, Salt, Liquid Risk Code: 3 RL-HLW-20
24	TSD System: Double Shell Tank System
25	Major Contaminants: Pu-238, 239, 240, 241; AM-241; U-238; C-14; Ni-59/63; Nb-94; Tc-99; I-129; Cm-242; Sr-90; Cs-137; Sn-126; Se-79; chromium; nitrate; nitrite; complexants (EDTA/HEDTA)
26	Contaminated Media: Tank waste consisting of high molarity sodium hydroxide/sodium nitrate solution containing saturated saltcake and/or sludge.
27	Volume/Size of Contaminated Media: All double shell tanks are 75 feet in diameter, and about 40 feet deep, with their tops buried about 10 feet below the ground surface.
28 *	Earliest Date Required: FY 2002
29 *	Latest Date Required: FY 2003
Baseline Technology Information	
30	Baseline Technology/Process: N/A Technology Insertion Point(s): T03-05-300, "Assess Need for DST Replacement," April 2005
31	Life-Cycle Cost Using Baseline: TBD
32	Uncertainty on Baseline Life-Cycle Cost: TBD
33	Completion Date Using Baseline: FY 2005
Points of Contact (POC)	
34	Contractor End User POCs: C.E. (Chris) Jensen, CHG, (509) 373-5058, Chris_E_Jensen@rl.gov G. P. (Gary) Duncan, CHG, (509) 376-6008, Gary_P_Duncan@rl.gov
35	DOE End User POCs: E.J. (Joe) Cruz, DOE-PRD, 509-372-2606, 509-373-1313, E_J_Cruz@rl.gov V. L. (Vic) Callahan, ORP, (509) 373-9880, Victor_L_Callahan@rl.gov
36	Other Contacts: R. A. (Ryan) Dodd, CHG, 509-373-5629, Ryan_A_Dodd@rl.gov K.A. (Ken) Gasper, CHG, 509-373-1948, F/509-376-1788, Kenneth_A_Ken_Gasper@rl.gov

*Element of a Site Need Statement appearing in IPABS-IS

**Element of a Site Need Statement required by CHG